year, it does not produce seed very freely. If this is true, one potent cause of its diminution and decay is obvious.

Like some other plants apparently also verging towards extinction, such as the Big Trees of California, this little survivor of the old flora of Pennsylvania shows no disposition to spread in Perry county, even in directions where it is unmolested. Ground lost by such a species cannot well be recovered. Point after point has been ceded to its foes; it has been killed off here and headed back there till now it lingers on this hillside, its last stronghold in the State, and almost in the world. What special causes have enabled it thus and there to maintain its ground against its foes it is impossible to say, but its position is very precarious. A little more cultivation, a little more ploughing and harrowing, a little more "clearing up" and "burning of brush," by the farmer, unaware of the value of what he was destroying, and the little Box Huckleberry will be numbered with the things that were and are not. Its only chance lies in the steepness and sterility of the hillside, which all botanists must hope will enable it long to maintain the unequal contest against so many dangerous foes. Perry county and Centre township will then continue to boast the possession of a natural botanical garden, containing one of the most interesting vegetable relics on earth.

Appendix.

August, 1883. The fruit of the Box Huckleberry is now ripe, and compared with that of other species is scanty. The berries grow singly and not one plant in ten is productive. They are edible, but lack sweetness, and are hence perhaps less attractive to animals. The blossom in early May was profuse, more so than that of its kindred species. The fruit is of the same size as theirs and is covered with a bloom like that of the low blueberry.

On the Equivalent of the New York Portage, in Perry County, Middle Pennsylvania.

(*Read before the American Philosophical Society, September 21, 1883.*)

The Cardiola Shale.

About 200 feet above the Fenestella shale, the topmost bed of the 300 feet of Hamilton Upper shale, which in Perry county is the highest layer in which a Hamilton fauna occurs, is a mass of shale differing in some respects from that above and below it. Though no sharp plane of limitation can be drawn at its base to separate it from the 200 (?) feet of barren black slate which is here the representative of the New York Genesee shale (so far as hitherto determined), yet a good physical distinction between the two is afforded in the field by the bleaching of the latter under the action of the air and light. This is so complete that a bank of weath-

ered material from these (Genesee) beds is quite white, whereas a fresh broken mass is nearly black. The shales of which I am now writing do not manifest any so marked change of color, but retain much more firmly their original black tint. They are very smooth and free from sand, usually dark, but sometimes greenish. They may be distinguished somewhat roughly in the field from the overlying Chemung proper, by the former of these characters and especially by the absence of those even-bedded, thin, fine-grained, square-fracturing beds of sandstone which so distinctively mark the Chemung proper in this region.

The beds below these Cardiola shales, that is the representatives of the Genesee of New York, are remarkably barren, and have thus far yielded me no fossils in Perry county. The lower beds of the Chemung proper have also proved unprofitable ground. But the 200 feet of shale to which I have assigned the above name, though by no means rich in fossils, have nevertheless yielded a few species which enable me with confidence to assign them their place as representatives of the Portage group of New York. Some of these are peculiar to these beds, and must therefore be considered "characteristic" for the district. Chief among them, and almost everywhere present where these beds are exposed, is the small but beautiful lamellibranch figured in the Geology of the Fourth District of New York, by Prof. Hall, under the name of *Avicula speciosa*, now *Cardiola speciosa*. This shell was confined in its range to the Portage group of New York at the time of publication of the Geology of the Fourth District, but is reported in the later volume (vol. v. p. 1) to occur also in the Genesee. In Perry county this species occurs toward the top of the beds that lie between the summit of the Hamilton and the base of the Chemung proper, and there is consequently little precipitancy in referring them to the Portage, a conclusion which is in full accord with the evidence furnished by stratigraphy.

I have not yet succeeded in establishing any wide or general physical plane of demarkation at which the fossils given on the next page cease and the Chemung fauna proper begins. The beds are somewhat barren with the exceptions here noted. But a very convenient local horizon is afforded by a heavy bed of sandstone which occurs about 200 feet above the top of the equivalent of the Genesee slate.

This bed of sandstone does not crop out in many places, but I have found it on the north side of the Buffalo hills on the road running from the old Juniata Furnace, where it forms the bank of the stream, and is thicker and more solid than anywhere else. It is also exposed on the road from Bloomfield to Newport, about a mile from the latter town.

Adopting this view we have, for Perry county, the following section in this part of the column :

	Feet.
Chemung shale and sandstone	
Portage-Chemung sandstone.....	20
Cardiola (Portage) shale:.....	200

	Feet.
Genesee shale	200
Fenestella shale	15
Tropidoleptus shale	15
Hamilton Upper (Ochrey) shale	150
Hamilton Fossil ore and Paracyclas shale	5
Hamilton sandstone	

THE CARDIOLA SHALE AND PORTAGE BEDS OF PERRY COUNTY.

List of Fossils.

1. Cardiola speciosa, Hall.
2. Styliola fissurella, Hall
3. Lunulicardium fragile, Hall.
4. Ambocœlia fimbriata, n. s.
5. Strophodonta perplana, v. parva, n. v.
6. Goniatites complanatus ?, Hall.
7. Coleolus acicula, Hall.
8. Poteriocrinus, sp. ?
9. Aulopora tubiformis, Hall.
10. Streptelasma, sp. ?
11. Pleurotomaria ?

Details on the palæontology and descriptions of the new species are deferred for want of time.

The new species *Ambocœlia fimbriata* named in the preceding list very much resembles the kindred species from the Hamilton, *Ambocœlia umbonata* Hall, but differs from it chiefly in being set with small, fine spines in regular concentric rows, a feature of which I have seen no trace in the fossils of this genus from other horizons in the county. The presence of these spines gives the casts of *A. fimbriata* an appearance much like those of *Spirifera fimbriata*, Hall.

Wherever the two beds can be examined in position I have found that those containing *Ambocœlia* lie above those containing *Cardiola*. In most sections only one of these fossils can be obtained, the exposures being usually small. Both are, however, so far as I have observed, strictly limited to this horizon, and consequently either is available for determining it.

The best exposure of the Cardiola shale in Centre township is about two miles S. W. of New Bloomfield opposite the house of Mr. Samuel Brown, and for some distance thence toward the hill (Iron ridge) where a small cut shows the shales containing *Cardiola speciosa* and *Ambocœlia fimbriata* in abundance. Measurement of their thickness is difficult on account of the concealment of their base and the uncertainty of dip which is not uniform in either degree or direction. Considerably more than 100 feet is exposed, and towards the upper part of the section the typical Chemung sandstones begin to appear among the shales. The Genesee slate is entirely con-

cealed, unless its topmost layers yield the loose material shown in the roadside cut nearly opposite Mr. Brown's house. This part of the section has yielded no fossils.

The Cardiola shale also appears in the side of the road leading to Perry Furnace near the house of Mr. Quigley. It is here a very smooth, yellow green shale, and has yielded

Cardiola speciosa.
Strophodonta perplana v. parva.
Amboccelia fimbriata.
Styliola fissurella.
Goniatites complanatus?

A third exposure of these beds is at the mouth of Losh's run, in Wheatfield township, where, in a cut on the roadside, the lower or Cardiola beds may be seen and their fossils collected. I have obtained here,

Cardiola speciosa.
Strophodonta perplana v. parva.

A fourth exposure of these Portage beds is on the south branch of Losh's run, about two miles west of the Juniata and near the cross-roads, at the house of Mr. D. Bosdorf. Here the upper beds only occur, yielding

Amboccelia fimbriata.
Strophodonta perplana v. parva.

A fifth exposure of these shales is on the road leading south from Newport to the ore works on Limestone ridge, near Pine grove. Near the house of Mr. J. Ramer occur dark smooth shales by the road yielding

Styliola fissurella.
Cardiola speciosa.
Coleolus acicula.

A sixth exposure of the same shales occurs near Newport, on the upper road to Baileysburg, soon after leaving the river. Here the Portage-Chemung sandstone is cut twice at a bend in the road, and close underneath it come the shales yielding the usual fossils. Only a few feet of the highest part of the Portage are exposed, but the following species were found after a short search:

Cardiola speciosa.
Amboccelia fimbriata.
Styliola fissurella.
Aulopora tubiformis.
Strophodonta perplana v. parva.

This exposure has also yielded me a small crinoid *Poteriocrinus*, apparently undescribed, and a *Streptelasma*, both of which I have been unable for want of time to examine minutely.

I have little doubt that the fauna of this Portage group might be much increased by longer search. One or two additional species have been already obtained by recent visits to some of the other places mentioned above.

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The following extract from the Geology of the Fourth District of New York will show the close resemblance between the rocks at the two places: "The thick-bedded sandstones at Portage form the terminal rocks of the group." "The upper part consists of thick-bedded sandstone." "The arenaceous strata of the Portage group are always more argillaceous than those of the Chemung group."

It appears from Prof. Hall's description of the group that it begins with beds very free from sand—the Cashaqua shale—and ends with a heavy thick-bedded sandstone. At least this is its character at its eastward exposures on the Genesee river. Farther west the sand, as usual, disappears and the group contains little except shale.

The Portage group in Perry county comes, therefore, as near to the typical Portage group in New York, as can be expected—near enough in stratigraphical and palæontological characters to give full confidence in their identification.

I may add, in conclusion, that some of the shale beds near the Portage-Chemung sandstone are much valued locally as whetstones. These apparently occur both above and below the sandstone.

In one place also, a bed of light-colored brown hematite has been exposed lying on the top of the sandstone and about eighteen inches thick. This is the only case of the occurrence of a bed of iron ore of any appreciable thickness in the Chemung of Perry county. No trial has yet been made of it, but judging from appearance it would not be of high grade.

The facts given above are useful in that they enable us to separate 400 feet from the great mass of olive shale in Perry county. The separation of 200 feet, as the Hamilton Upper shale, was mentioned in the beginning of this article. The total thickness of the olive shales of VIII has been given in the neighborhood of Newport, at about 5500 feet, thus divided:

Chemung	3800	
Portage	600	about.
Genesee	1120	
	5520	

But these measurements are much exaggerated. They have apparently been made along the Juniata, without noticing a fold which occurs at Inoculate run, and the effect of which extends beyond the river. The ground is very difficult, but the following figures, which I have obtained with considerable trouble and checked as carefully as was possible with the limited time at my command, are certainly nearer the truth for the neighborhood of Newport:

Chemung	3000
Portage	200
Genesee	200
	3400

It thus appears that after the separation of the 600 feet above mentioned,

the thickness of which is only approximately given here, there yet remains an immense mass, the subdivision of which is more difficult, but would not perhaps be impossible if sufficient time were allowed.

I am unable as yet to say if these Cardiola shales extend far north and south, no exposures having been yet found. But the places above mentioned trace them through the middle of the county from south-west to north-east, a distance of seven or eight miles. Their farther extension is very little less than certain.

Appendix.

Since the above paper was read I have spent a few hours with Prof. I. C. White, now engaged in the survey of Huntingdon county. With his assistance I found the bed here described and most of its fossils near Huntingdon. The thickness, though shortness of time prevented measurement, seems also very nearly the same.

Note on the Genus Rensselaeria in the Hamilton Group in Perry Co. By *E. W. Claypole.*

(*Read before the American Philosophical Society, September 21, 1883.*)

The Genus Rensselaeria, Hall, was established to receive certain Brachiopods, some of which were new, and others of which had previously been known under other names. They were distinguished by their general outward form and certain peculiarities of internal structure from other Brachiopods nearly allied to them.

The Genus Rensselaeria is limited in Eastern North America to the Lower Helderberg and Oriskany groups, four of its twelve species occurring in the former and seven in the latter. One only, a small species, *R. Johanni*, Hall, has been described from the Upper Helderberg of Waterloo, Iowa. Of this Prof. Hall speaks doubtfully, referring it to this genus only on account of its external characters.

Prof. Hall informs me that he has since that time removed this species from the genus. It is, therefore, rather surprising to find well-marked specimens of Rensselaeria high up in the Hamilton group of Middle Pennsylvania. Yet the sandstone, so conspicuous a feature of this group in Perry and adjoining counties; yields, near its middle, a bed which is in some places little more than a mass of shells of a form which can scarcely, if at all, be distinguished from *R. Marylandica* of the Oriskany sandstone.

In some places this shell is found almost alone, but in others it occurs mixed with *Spirifera formosa*, or a species so like it that I cannot distinguish them. This Spirifera is the most abundant fossil in the Hamilton sandstone of the county, occurring sometimes in myriads.